Glenn Research Center, Environmental Programs Manual

Chapter 16 - LOCAL EXHAUST VENTILATION

NOTE: The current version of this Chapter is maintained and approved by the Environmental Management Office (EMO). The revision date for this chapter is April 2003. If you are referencing paper copies, please verify that it is the most current version before use. The current version is maintained on the Glenn Research Center intranet at http://osat-ext.grc.nasa.gov/emo/pub/epm/epm-contents.pdf. Approved by: EMO Chief, Michael Blotzer {mailto: Michael.J.Blotzer@grc.nasa.gov}

PURPOSE

This chapter establishes minimum requirements for local exhaust ventilation (LEV) for controlling occupational exposure to air contaminants at GRC.

APPLICABILITY

This chapter is applicable to all personnel at Glenn and Plum Brook Station, including, but not limited to, civil servants, contractor personnel, and students.

DEFINITIONS

Air Cleaning Device
A device used to separate contaminants from the air stream before discharge to the ambient air. Examples include, filters, scrubbers, electrostatic precipitators, cyclones, drop out boxes, and afterburners.

Air Filter
A mechanical device that removes contaminants from the air-stream.

Air Velocity
The rate of motion of air in a given direction, measured as distance per unit time. Units for air velocity are meters per second (m/sec), feet per minute (ft/min or fpm), miles per hour (mph).

Carcinogen
A substance or agent capable of causing or producing cancer in mammals, including humans. A chemical is considered to be a carcinogen or potential carcinogen if; a) it has been evaluated by the International Agency for Research on Cancer (IARC) and found to be a carcinogen or potential carcinogen; b) it is listed as a carcinogen or potential carcinogen in the annual report on carcinogens published by the National Toxicology Program (NTP); or c) it is regulated by OSHA as a carcinogen.

Capture Velocity
The velocity at any point in front of the hood necessary to overcome opposing air currents and to capture the contaminated air by causing it to flow into the exhaust hood.

Carcinogenic
A substance or material capable of producing cancer.

Duct
A passageway made of sheet metal or other suitable material used for conveying air, gasses, vapors, dust, mist, or fumes. In the case of a duct in a local exhaust ventilation system, it is the component that carries contaminants from the hood to, usually, outside the building

Duct System
A series of ducts, elbows, and connections to convey air or other gasses from one location to another.

Entry Loss
The loss in pressure caused by air flowing into a duct or hood that is usually measured in inches water gauge.

Fan
The local exhaust ventilation system component that provides the energy required by a specific design to move air through a system.

Hood
A device that encloses, captures, or receives emitted contaminants to effectively control contaminants at the source with minimum air flow and power consumption. A shaped inlet designed to capture contaminated air and direct it into the exhaust duct system.

Hood Face Velocity
Air velocity at the hood face opening measured in feet per minute (fpm).

Inert Gas
A gas that does not react or undergo any change of state in a system or process.

Local Exhaust Ventilation (LEV)
An industrial ventilation system that captures and removes emitted contaminants before they are released into the workplace environment. The component parts of an LEV are the hood or air capture device, duct system, air-cleaning device, fan, and stack.

Plenum
A chamber used in local exhaust ventilation systems to equalize pressure.

Pressure, Static
The potential pressure exerted in all directions by a fluid at rest. For a fluid in motion, it is measured in a direction normal to the direction of flow and is usually expressed in inches water gauge when dealing with air. The tendency either burst or collapse the duct.)

Pressure, Velocity
The kinetic pressure in the direction of flow necessary to cause a fluid at rest to flow at a given velocity that is usually measured in inches water gauge.

Stack
A device used to discharge air away froma building..

Toxicity
Relative property of a chemical agent thatrefers to the harmful effect it exerts on some biologic mechanism and the conditions under which the effect occurs.

Ventilation
The process of supplying or removing air by natural or mechanical means to or from any space.

BACKGROUND

A variety of materials, ranging from inert gases to highly toxic, carcinogenic materials are used by GRC personnel. Local exhaust ventilation (LEV) is a general engineering control used to minimize worker exposure to airborne hazardous substances.

A LEV system typically consists of a hood to capture or contain the contaminants, ducts to transport the air containing the contaminants, and a fan to provide the exhaust or discharge the air outside the building. Depending on the system and the level of contaminant generation, the LEV may be equipped with air filtration unit, such as high-efficiency particulate air (HEPA) filters, scrubber, electrostatic precipitator or other air-pollution control device.

Examples of LEV at GRC include laboratory fume hoods, exhausted gas cabinets, welding snorkels, and paint booths. Local exhaust ventilation for toxic materials may require an air-pollution permit for operation. Please refer to Chapter 4, "Air Pollution Control," for additional information.

POLICY

Construction, installation, inspection, and maintenance of LEV shall comply with OSHA standards, as well as with national consensus standards, such as the American National Standards Institute (ANSI) and the American Conference of Governmental Industrial Hygienists (ACGIH).

REQUIREMENTS

Newly purchased laboratory fume hoods shall include, at a minimum, a continuous face velocity monitor for the purpose of measuring hood performance.

All LEV systems are inspected and tested at least annually by the IHT. Continuous face velocity monitors shall be tested and calibrated annually. Each LEV hood is tagged with the LEV Identification #, date of the test (month and year), person conducting the test, and the NASA GRC telephone extension number of that individual. When the sash for a laboratory fume hood is not in the closed or nearly closed position, it shall be adjusted such that the hood provides a face velocity at 100 fpm $\pm$20%. The sash height will be marked on the survey tag or on the hood itself to clearly indicate the required sash height,.

Hoods that are equipped with continuous airflow monitoring gauges are reviewed during the survey and must indicate the flow within + 10% of the actual flow.

RESPONSIBILITIES

Industrial Hygiene Team (IHT)

- Provides guidance on the requirements of Federal, State, and Local ventilation regulations as well as standard industry practice guidelines.
- Maintains a registry of all LEV at GRC.
- Performs an annual survey of all LEV's in the registry.
- Maintains a reference library on industrial ventilation and should be consulted for guidance.

Plum Brook Management Office (PBMO)

- Maintains a registry of all LEV at Plum Brook Station.
- Performs an annual survey of all LEV's in the registry.

Project Engineers

- Facilities Division (FD) project engineers must review and approve all new or modified LEV systems before installation.
- Receive training in ventilation design for contaminant control
- Ensure LEV design specifications comply with the requirements of this program.
- Inform the IHT of all newly installed or modified LEV systems and request a ventilation survey before releasing the system for use.

Operations and Maintenance Personnel

- Inform the IHT of all modifications or repairs of LEV systems and request a ventilation survey before releasing the system for use.

Supervisors

- Ensure that LEV is operated in accordance with the requirements of this program.
- Stop operations, tag the LEV "out of service," and contact the IHT if, a LEV system is suspected of being deficient or if continuous airflow monitoring device malfunctions.
- Inform the IHT of all newly installed LEV systems and all modifications or repairs of LEV systems and request a ventilation survey before releasing the system for use.
- Contact FTED in preliminary stages of tasks involving the installation or modification of LEV systems. All LEV systems must be reviewed and approved by FTED before they are installed.

Employees

- Operate LEV in accordance with this program
- Conduct operations in laboratory hoods so that the hood sash is raised no higher than the point where the face velocity is within the appropriate operating specifications (80-120 fpm) and the face velocity monitor is not in alarm mode.
- Report any LEV that does not appear to adequately control exposure to air contaminants.
- When a laboratory hood is alarming, immediately lower the sash to a level at which the alarm ceases and reset it. If it continues to alarm, notify the IHT.
- Area Safety Committee members, in their review of new or modified installations, shall ensure compliance with this program.

PROCEDURES

Refer to flow chart for local exhaust ventilation procedure

RECORDS

- Database of ventilation surveys and results

REFERENCES

U.S. Department of Labor, Occupational Safety and Health Administration, 29 CFR 1910.95, Ventilation.

American Conference of Governmental Industrial Hygienists, Industrial Ventilation: A Manual of Recommended Practice, Cincinnati, Ohio, 1990.

American National Standards Institute, American National Standard Fundamentals Governing the Design and Operation of Local Exhaust Systems, Z9.2-1060 and Z33.1-1961.

American National Standards Institute, American National Standard for Laboratory Ventilation, Z9.5-1992.

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